



Product Information from NAIMA:

Fibrous Glass Duct System

In this issue, we address the specific uses, performance characteristics including thermal and acoustical, condensation control, leakage, reinforcement, closure, code compliance and installation recommendations for fibrous glass duct systems.

Uses

The fibrous glass duct system is used to conserve heating and cooling energy and to control duct-borne noise in commercial, institutional, or residential heating, ventilating and air conditioning ductwork operating in the range of ± 2 in. w.g. (± 500 Pa) static pressure, up to a minimum of 2,400 fpm (12.2 m/sec) internal air velocity, and internal air temperature between 40°F (4°C) and 250°F (121°C). Ducts are only for indoor use and should be located in areas where ambient temperature does not exceed 150°F (66°C).

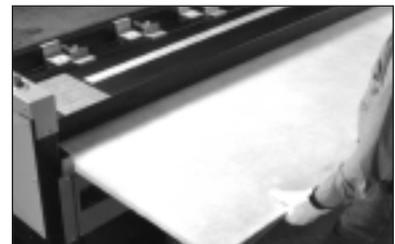
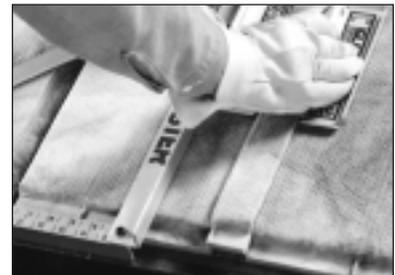
Description

The fibrous glass duct system is normally made up of nominal four-foot (1.2 m) modules which are fabricated from 1, 1½ or 2 in. (25, 38, or 51 mm) thick flat fibrous glass duct board stock having a factory-applied reinforced aluminum exterior air barrier finish. Duct system modules are fabricated using either specially designed hand tools or grooving and closure machines. These modules may have factory shiplapped male and female ends which assure close-fitting, smooth joints when duct sections are joined. Ducts with spans up to 96 in. (2.4 m) may be constructed when proper reinforcement is used. Duct fittings such as tees, offsets, elbows, and

transitions are also fabricated from these modules or from flat duct board. Equipment such as electric or hot water in-line heaters, manual or powered volume dampers, registers and grilles, diffuser drops, and access doors may be incorporated into a fibrous glass duct system.

Fibrous glass duct boards are available with a durable interior surface treatment to enhance cleanability when NAIMA guidelines are followed.

Fabrication tools are available to produce ten-sided (essentially round) fibrous glass duct modules.



Fibrous glass duct board may be grooved using special hand tools (top) or duct board grooving machines (bottom).

Features and Benefits

Single-component system

Thermal and acoustical insulation plus essentially air-tight performance are provided with one product installed by a single contractor.

Factory-controlled insulation thickness

Factory-controlled insulation thickness assures that specified R-values are met.

Acoustically efficient

Fibrous glass insulation absorbs fan and air turbulence noise, reduces popping noises caused by expansion, contraction, and vibration.

Light weight

Fibrous glass duct components are easy to fabricate, transport, and install. Compared with metal ductwork, they impose less load on the building structure.

Essentially air-tight

Saves energy by virtually eliminating air leakage.

Code compliance

When correctly fabricated and installed, fibrous glass duct systems qualify under UL 181 as Class 1 Rigid Air Ducts, meeting the fire safety requirements of NFPA 90A and 90B including limited combustibility, ASTM E 84 surface burning characteristic of 25/50, and ASTM C 411 at a minimum of 250°F (121°C). They also comply with all requirements listed in the ICC building codes. Closures must be made with UL 181A listed pressure-sensitive tape, heat-activated tape, or glass fabric and mastic.

Backed by industry standards

Fabrication and installation standards published by NAIMA and SMACNA help the contractor to provide reliable, long-term system performance.

Microbial growth resistance

Fiber glass insulations are inorganic and inert and do not support mold growth or act as nutrient for mold growth. For additional information, see *Facts #34: Glass Fiber Air Transmission Systems: The Facts About Mold Growth (AH113)*. Fibrous glass duct systems resist fungal and bacterial growth when tested in accordance with UL 181 and standard practices ASTM G 21-96 (fungus test), G 22-96 (bacteria test), ASTM C 1338. Fiber glass duct systems conform to ASHRAE 62.1.

Thermal Performance

Fibrous glass duct board minimizes heat loss or gain through duct walls, efficiently delivering conditioned air to occupied spaces at or near design temperatures.



Completing duct section using closure machine.

R-values, measured in accordance with ASTM C 518, are shown in Table 1.

Table 1 - Thermal Values (ASTM C 518)

in. (mm)	1 (25)	1½ (38)	2 (51)
R-value, hr•ft ² •°F/Btu (RSI, m ² •°C/W)	4.3 (0.76)	6.5 (1.14)	8.7 (1.53)
k value, Btu•in/hr•ft ² •°F (λ, W/m•°C)	0.23 (0.033)	0.23 (0.033)	0.23 (0.033)
C value, Btu/hr•ft ² •°F (C, W/m ² •°C)	0.23 (1.32)	0.16 (0.88)	0.11 (0.65)

Thermal values are for insulation only as determined by ASTM C 518 at 75° F (24° C) mean temperature and do not include air films or reflective surfaces. Values are subject to normal testing and manufacturing tolerances.

Table 2 - Acoustical Performance (ASTM C 423)

Thickness		Sound absorption coefficients, Hz						
in.	(mm)	125	250	500	1000	2000	4000	NRC
1	(25)	.03	.18	.61	.83	.89	.93	.65
1½	(38)	.09	.33	.89	.96	.95	.94	.80
2	(51)	.17	.63	1.08	1.05	1.04	1.06	.95

*Type A mounting per ASTM E 795.
Consult individual manufacturers for specific acoustical performance data.*

Acoustical Performance

Fibrous glass insulation absorbs fan and air turbulence noise and reduces the popping noises caused by expansion and contraction. Typical acoustical performance values are shown in Table 2.

Condensation Control

Figure 1 shows the installed R-values of fibrous glass duct board required to prevent moisture condensation on the outer duct surface under varying conditions of ambient temperature and relative humidity. Curves are based on cold duct internal temperatures of 55°F (13°C) and no air movement on the exterior surface. Note: R-values as required by ASHRAE 90.1 may not be sufficient for condensation control.

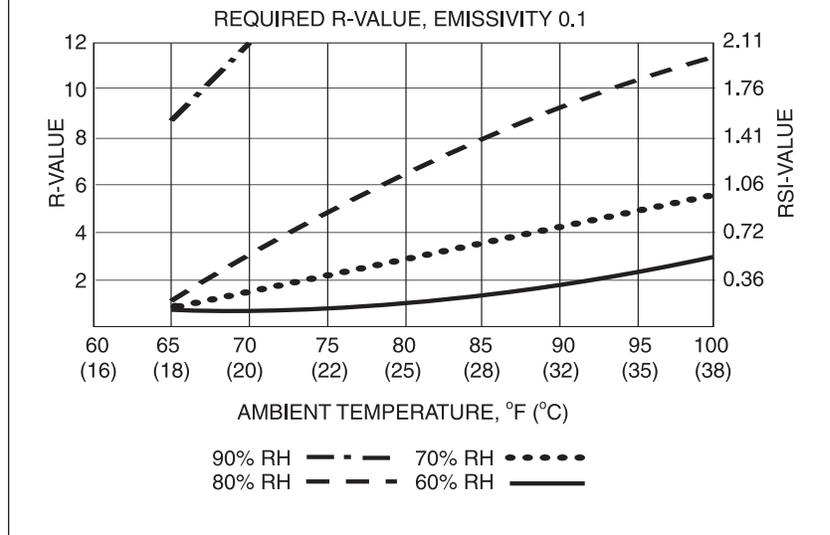
Leakage Control

Fibrous glass duct systems have inherently low leakage as indicated by tests conducted by ASHRAE/SMACNA/TIMA. Duct leakage reduces the delivered volumes of air at diffusers and grilles; this must be compensated for by increasing the total quantity of supply air. For details on test results, refer to *NAIMA Fibrous Glass Duct Construction Standards (AH116)*, current edition.

Reinforcement

Tie rods or sheet metal channels may be used when reinforcement is required to restrain duct

Figure 1 - Required R-Values to Prevent Moisture Condensation



wall deflection due to duct span and/or operating pressure. Reinforcement details are found in Section V of the *NAIMA Fibrous Glass Duct Construction Standards (AH116)* previously referenced.

Closure

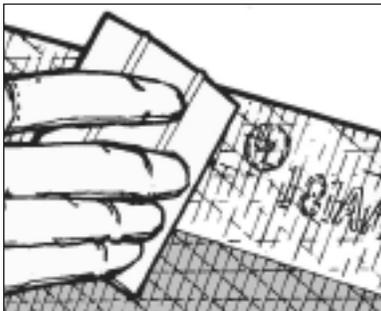
Longitudinal and transverse joints of fibrous glass duct modules are sealed using one of three UL 181A listed closures:

- UL 181A, Part I (P) - Staples and pressure-sensitive aluminum foil tape. 2½ in. (64 mm) wide tape may be used in making closures with 1 in. (25 mm) duct board. 3 in. (76 mm) wide tape is recommended for 1½ in. (38 mm) duct board, and is mandatory with 2 in. (51 mm) duct board.

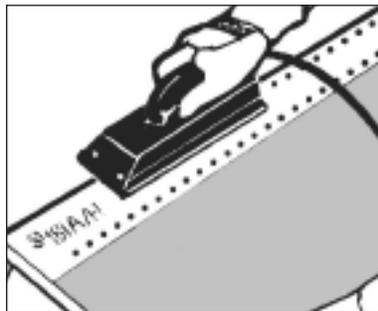
- UL 181A, Part II (H) - Heat-activated aluminum foil/scrim tapes, 3 in. (76 mm) wide.
- UL 181A, Part III (M) - Mastic reinforced with 3 in. (76 mm) wide glass fiber fabric (scrim). This closure system may be required when the system is part of a fire-rated assembly.

Equipment Connections

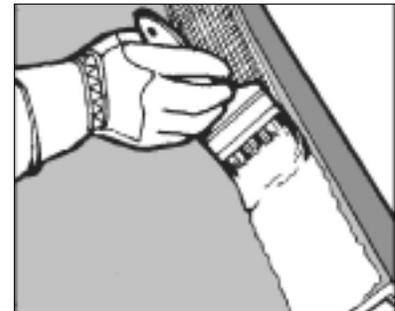
When connecting fibrous glass duct systems to sheet metal components such as equipment flanges, fasteners such as sheet metal screws and washers are used to carry the mechanical load. Mastic and glass fiber fabric are used to seal the connections at these points. However, UL 181A listed pressure-sensitive aluminum foil tape may be used to seal fibrous glass ducts to



Closure with pressure-sensitive foil tape



Closure with heat-activated foil tape



Closure with glass fiber fabric and mastic

sheet metal when operating pressure is less than ± 1 in. w.g. (± 250 Pa) and when sheet metal surfaces are cleaned in accordance with tape manufacturers' instructions. Closure details may be found in Section IV of the *NAIMA Fibrous Glass Duct Construction Standards (AH116)*.

The use of non-listed closure materials or techniques voids the UL 181 Class 1 Air Duct rating.

Hanging and Support

Fibrous glass ducts are light in weight and can be supported with a minimum of hangers. Care must be taken as to placement of hangers and support. Details may be found in Section VI of the *NAIMA Fibrous Glass Duct*

Construction Standards (AH116).

Note: *NAIMA Fibrous Glass Duct Construction Standards (AH116)* is applicable to all types of duct construction. For residential construction, *NAIMA Fibrous Glass Residential Duct Construction Standards (AH119)* may be used.

About NAIMA

NAIMA is the association for North American manufacturers of fiber glass, rock wool, and slag wool insulation products. Its role is to promote energy efficiency and environmental preservation through the use of fiber glass, rock wool, and slag wool insulation, and to encourage the safe production and use of these materials.

In May, 1999, NAIMA began implementing a comprehensive voluntary work practice partnership with the U. S. Occupational Safety and Health Administration (OSHA). The program, known as the Health and Safety Partnership Program, or HSPP, promotes the safe handling and use of insulation materials and incorporates education and training for the manufacture, fabrication, installation, and removal of fiber glass, rock wool, and slag wool insulation products.

For more information, contact: NAIMA

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Alexandria, VA 22314
Phone: 703-684-0084
Fax: 703-684-0427
www.naima.org

For additional information on fibrous glass duct systems, contact one of the manufacturers listed below.

CertainTeed Corp.
P. O. Box 860
Valley Forge, PA 19482
800-233-8990

Johns Manville
P. O. Box 5108
Denver, CO 80217
800-654-3103

Knauf Insulation
One Knauf Drive
Shelbyville, IN 46176
800-825-4434

Owens Corning
One Owens Corning Parkway
Toledo, OH 43659
800-GET-PINK

Short Form Field Inspection Check List		YES	NO
<i>(Refer to NAIMA Fibrous Glass Duct Construction Standards (AH116) for details)</i>			
Is duct system static pressure within specified limits?	<input type="checkbox"/>	<input type="checkbox"/>	
Was the proper R-Value selected for condensation control and energy conservation?	<input type="checkbox"/>	<input type="checkbox"/>	
Is the EI rating (475, 800, or 1400) printed on the board?	<input type="checkbox"/>	<input type="checkbox"/>	
Are all sheet metal accessories of galvanized steel?	<input type="checkbox"/>	<input type="checkbox"/>	
Is foil closure tape marked UL 181 A-P or UL 181 A-H?	<input type="checkbox"/>	<input type="checkbox"/>	
Is all duct board stock labeled UL 181?	<input type="checkbox"/>	<input type="checkbox"/>	
Do glass fabric and mastic closures meet UL 181 A-M requirements?	<input type="checkbox"/>	<input type="checkbox"/>	
Are all seams and joints properly stapled or, where stapling flaps are not available, are tape tabs used, minimum of one per side, 12 in. (300 mm) on center?	<input type="checkbox"/>	<input type="checkbox"/>	
Does fitting fabrication meet NAIMA standard requirements?	<input type="checkbox"/>	<input type="checkbox"/>	
Does equipment installation meet NAIMA standard requirements?	<input type="checkbox"/>	<input type="checkbox"/>	
Do reinforcement elements meet NAIMA standard requirements?	<input type="checkbox"/>	<input type="checkbox"/>	
Do hangers and supports meet NAIMA standard requirements?	<input type="checkbox"/>	<input type="checkbox"/>	
Are ducts free from unrepaired tears or punctures?	<input type="checkbox"/>	<input type="checkbox"/>	